

CLAIM AMENDMENTS

Claim Amendment Summary

Claims pending

- Before this Amendment: Claims 1-19, 21-28, 30-33, and 36.
- After this Amendment: Claims 1, 3-19, 21-25, 27, 28, 30, 32, 33, 36, and 37

Claims Non-Elected, Canceled, or Withdrawn herein: 2, 26, and 31

Claims Amended herein: 1, 3, 10-13, 25, 27, 28, 30, 32, and 33

New claims herein: none

Claims:

1. (Currently Amended) A computer-implemented method for processing video data comprising:

determining an ideal playback timing associated with the video data, the ideal playback timing determined at least in part by way of information encoded in the video data; and

if an actual playback timing of the video data lags the ideal playback timing, the lag resulting from a limited processing power of the computer implementing the method, varying a frame rate associated with the video data using a smoothing function to recover toward the ideal playback timing, wherein smoothly varying the frame rate includes controlling the frame rate using a frame-dropping algorithm that drops frames in the video data in accordance with the smoothing function.

2. (Canceled)

3. (Currently Amended) The computer-implemented method as recited in Claim [[2]] 1, wherein controlling the frame rate includes:

computing a delay by comparing the actual playback timing with the ideal playback timing; and

if the delay exceeds a threshold value, determining that the actual playback timing lags the ideal playback timing.

4. (Original) The computer-implemented method as recited in Claim 3, wherein the threshold value accounts for ordinary system variations.

5. (Original) The computer-implemented method as recited in Claim 3, wherein the delay is computed by subtracting the ideal playback timing from the actual playback timing.

6. (Original) The computer-implemented method as recited in Claim 3, wherein the smoothing function incorporates the delay as a variable.

7. (Original) The computer-implemented method as recited in Claim 3, wherein the delay is computed as an average delay that includes an average of the delay associated with a current frame of the video data and at least a delay associated with a previous frame.

8. **(Original)** The computer-implemented method as recited in Claim 7, wherein the average delay is an average of delays associated with the current frame and a plurality of previous frames.

9. **(Original)** The computer-implemented method as recited in Claim 2, wherein the frame-dropping algorithm includes a rasterization algorithm.

10. **(Currently Amended)** The computer-implemented method as recited in Claim [[2]] 1, wherein the frame-dropping algorithm includes if a current frame is a B-frame, dropping the current frame.

11. **(Currently Amended)** The computer-implemented method as recited in Claim [[2]] 1, wherein the frame-dropping algorithm includes if a current frame is an I-frame, showing the current frame without further determination.

12. **(Currently Amended)** The computer-implemented method as recited in Claim [[2]] 1, wherein the frame-dropping algorithm includes if a current frame is a P-frame, processing the current frame to obtain enough information for processing subsequent frames before dropping the current frame.

13. **(Currently Amended)** The computer-implemented method as recited in Claim [[2]] 1, wherein the frame-dropping algorithm includes if the actual playback timing does not lag the ideal playback timing, overriding any determination to drop frames.

14. **(Original)** The computer-implemented method as recited in Claim 1, wherein the ideal playback timing is determined from a presentation clock.

15. **(Original)** The computer-implemented method as recited in Claim 14, wherein the presentation clock includes a filter configured to remove noise.

16. **(Original)** One or more computer-readable memories containing a computer program that is executable by a processor to perform the computer-implemented method recited in Claim 1.

17. **(Previously Presented)** A computer-implemented method for managing video data frame rates comprising:

determining delays associated with playback of frames of video data;

calculating an average delay from averaging the delays;

determining an ideal frame rate associated with the frames;

calculating a frame skip factor; and

varying the frame rates associated with the playback by applying a frame-dropping algorithm configured to determine whether to drop a current frame using the frame skip factor, wherein the frame-dropping algorithm includes:

if the frame skip factor is greater than the ideal frame rate, adding the ideal frame rate to an iterator; and

if the iterator is greater than or equal to the frame skip factor, subtracting the frame skip factor from the iterator and showing the current frame.

18. **(Original)** The computer-implemented method as recited in Claim 17, wherein the frame skip factor is calculated with a tolerance factor that accounts for variability in a system timer.

19. **(Original)** The computer-implemented method as recited in Claim 17, wherein the frame-dropping algorithm includes an iterative algorithm that varies the frame rates using a smoothing function that includes the frame skip factor.

20. **(Canceled).**

21. **(Previously Presented)** The computer-implemented method as recited in Claim 17, wherein the frame-dropping algorithm includes if the iterator is less than the frame skip factor, dropping the current frame.

22. **(Original)** The computer-implemented method as recited in Claim 21, wherein the frame-dropping algorithm includes:

if the iterator is less than the frame skip factor, determining whether the average delay has reached a significant percentage of a maximum delay; and

if so, showing the next I-frame subsequent to the current frame.

23. **(Original)** The computer-implemented method as recited in Claim 17, wherein priority is given to the execution of the computer-implemented method to improve the quality associated with the calculated frame rates.

24. (Original) One or more computer-readable memories containing a computer program that is executable by a processor to perform the method recited in Claim 17.

25. (Currently Amended) An apparatus comprising:
means for determining an ideal playback timing associated with video data;
means for varying a frame rate associated with the video data using a smoothing function to recover toward the ideal playback timing;
means for controlling the frame rate using a frame-dropping algorithm that drops frames in the video data in accordance with the smoothing function;
means for computing a delay by comparing an actual playback timing with the ideal playback timing, the actual playback timing lagging the ideal playback timing as a result of a limited processing capability of the apparatus; and
means for incorporating the delay into the smoothing function.

26. (Canceled)

27. (Currently Amended) The apparatus as recited in Claim ~~[[26]]~~ 25, further comprising means for buffering the video data so that the frame-dropping algorithm is executing ahead of real time.

28. (Currently Amended) The apparatus as recited in Claim ~~[[26]]~~ 25, further comprising means for incorporating a rasterization algorithm into the frame-dropping algorithm.

29. (First Instance) (Canceled).

29. (Second Instance) (Canceled).

30. (Currently Amended) One or more computer-readable media having stored thereon a computer program that, when executed by one or more processors, causes the one or more processors to perform a method comprising:

~~determine~~ determining an ideal playback timing associated with video data; and

if an actual playback timing of the video data lags the ideal playback timing, vary a frame rate associated with the video data using a smoothing function to recover toward the ideal playback timing, wherein:

the lag results from an inherently limited processing capability of a system processing the video data; and

the frame rate is smoothly varied by applying a frame-dropping algorithm that drops frames in the video data in accordance with the smoothing function.

31. (Canceled)

32. (Currently Amended) One or more computer-readable media as recited in Claim ~~[[31]]~~ 30, wherein the frame-dropping algorithm includes:

computing an average delay by averaging delays associated with frames in the video data, and

incorporating the average delay into the smoothing function.

33. (Currently Amended) An electronic device comprising:
a memory; and
a processor coupled to the memory, the processor being configured to:
~~determine an ideal delays associated with playback timing associated with~~
~~of frames of video data; and~~
~~calculate an average delay from averaging the delays;~~
~~determine an ideal frame rate associated with the frames;~~
~~calculate a frame skip factor; and~~
~~if an actual playback timing of the video data lags the ideal playback~~
~~timing, vary a frame rate associated with the playback by applying a frame-~~
~~dropping algorithm configured to determine whether to drop a current frame using~~
~~the frame skip factor, wherein the frame-dropping algorithm includes: video data~~
~~using a smoothing function to recover toward the ideal playback timing, the lag~~
~~resulting from an inherently limited processing capability of the electronic device,~~
~~and wherein the processor is further configured to:~~
~~if the frame skip factor is greater than the ideal frame rate, adding~~
~~the ideal frame rate to an iterator; and~~
~~if the iterator is greater than or equal to the frame skip factor,~~
~~subtracting the frame skip factor from the iterator and showing the current~~
~~frame~~
~~compute an average delay by averaging delays associated with~~
~~frames in the video data and incorporate the average delay into the~~
~~smoothing function; and~~

~~apply a frame-dropping algorithm that drops frames in the video data
in accordance with the smoothing function.~~

34-35. (Canceled).

36. (Previously Presented) The apparatus as recited in Claim 25, further comprising:

means for computing an average delay associated with playback of a plurality of frames; and

means for incorporating the average delay into the smoothing function.